

# Network Management

## Reading:

Leinwand, A. & Conroy, K. F. (1996) Network Management: A Practical Perspective 2nd ed. Addison-Wesley. Chapters 1 & 2.

Stevenson, D. W. (1995) Network Management What it is and what it isn't.  
<<http://www.sce.carleton.ca/netmanage/NetMngmnt/NetMngmnt.html>> [Accessed October 1 2008]

Cisco. (2002) Network Management Basics.  
<[http://www.cisco.com/univercd/cc/td/doc/cisintwk/ito\\_doc/nmbasics.pdf](http://www.cisco.com/univercd/cc/td/doc/cisintwk/ito_doc/nmbasics.pdf)> [Accessed October 1 2008]

Cisco. (2005) Network Management System Best Practices White Paper.  
<[http://www.cisco.com/warp/public/126/NMS\\_bestpractice.pdf](http://www.cisco.com/warp/public/126/NMS_bestpractice.pdf)> [Accessed October 1 2008]

## **What is Network Management?**

*Network Management* is the process of controlling a complex data network to maximise its efficiency and productivity.

Leinwand, A. & Conroy, K. F. (1996, p. 8)

## **The Network Management Platform**

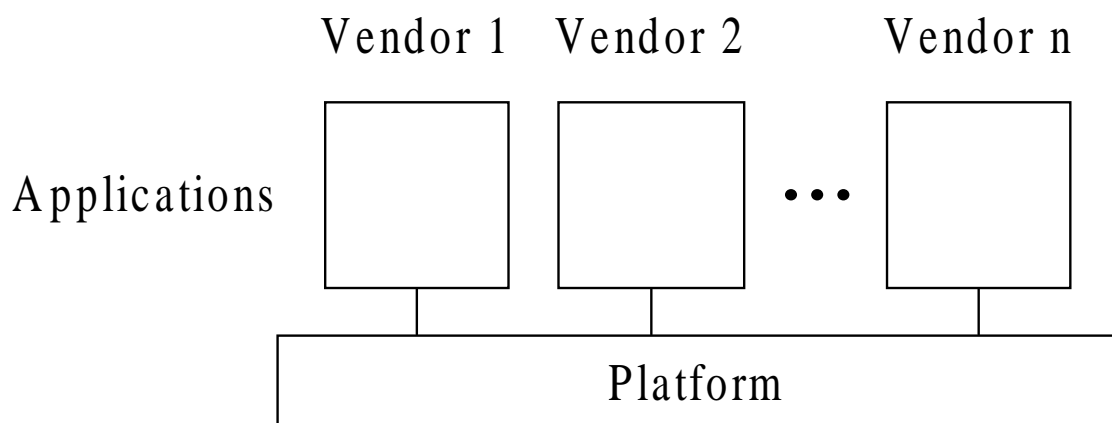
A network management platform is a software package that provides a generic functionality for managing a variety of network devices. A platform should typically include:

- A GUI
- A network map — autodiscovery, automapping
- A DBMS
- A standard method to query devices
- A event log
- A customisable menu system
- Graphing tools
- An API
- System security

## Network Management Applications

Goals:

- Manage a specific set of devices
- Avoid functionality overlap with the platform
- Integrate with the platform through the API and menu system
- Reside on multiple platforms

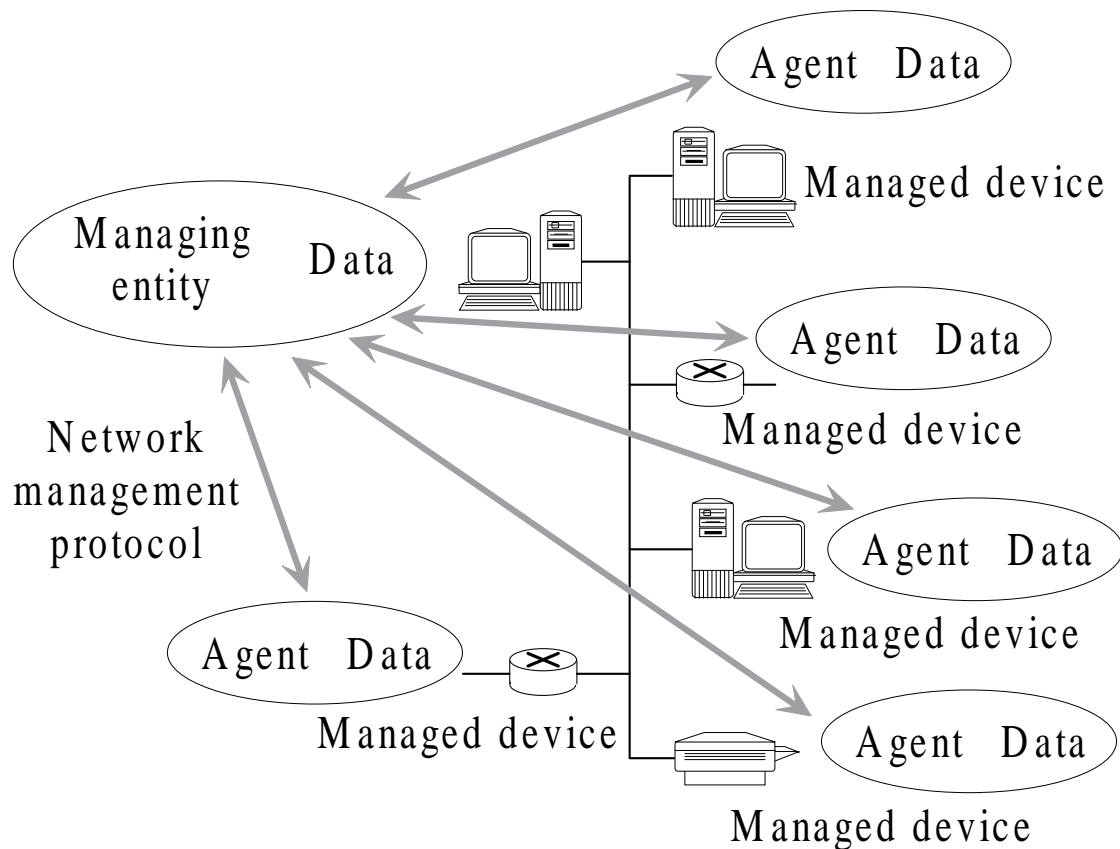


Relationship between network management platform and applications

## The Network Management System

The network management system consists of the platform and the accompanying applications.

### Principle Components of a Network Management Architecture



**Managing entity** — application running on a network management station — controls the collection, processing, analysis/display of network management information.

**Managed device** — network equipment. Within a managed device there may be several **managed objects**.

**Managed objects** — actual pieces of hardware within the managed device e.g. NIC and the sets of configuration parameters for the pieces of hardware and software.

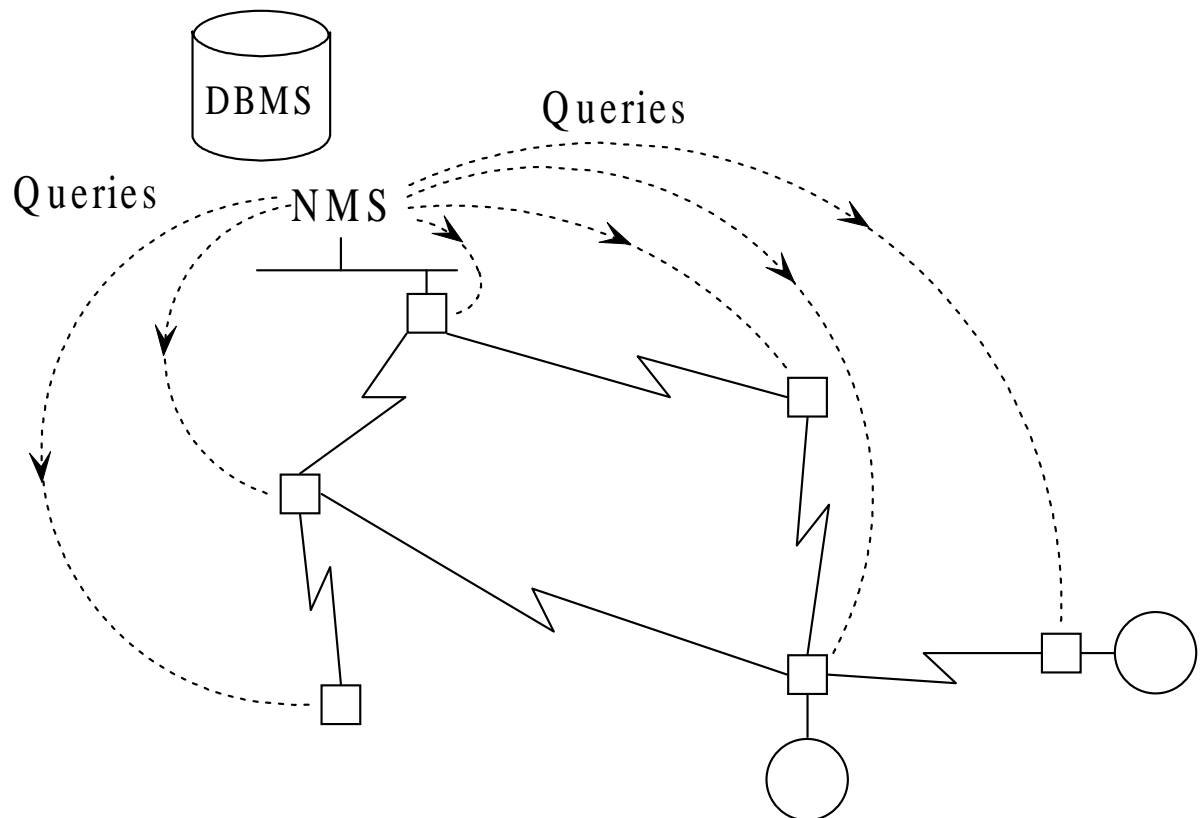
**Management information base (MIB)** — virtual information store holding the values associated with managed objects. These values collectively reflect the current state of the network.

**Network management agent** — process running on a managed device that communicates with the management entity and takes local actions on managed device under control of management entity.

**Network management protocol** — runs between the management entity and a managed device and allows querying of status and action to be taken on the device via the agent. Agents can use the protocol to inform the management entity of exceptional events (**traps**).

## Types of Network Management Topology

### Centralised



Based on one physical system

## **Benefits & Drawbacks of Centralised Topology**

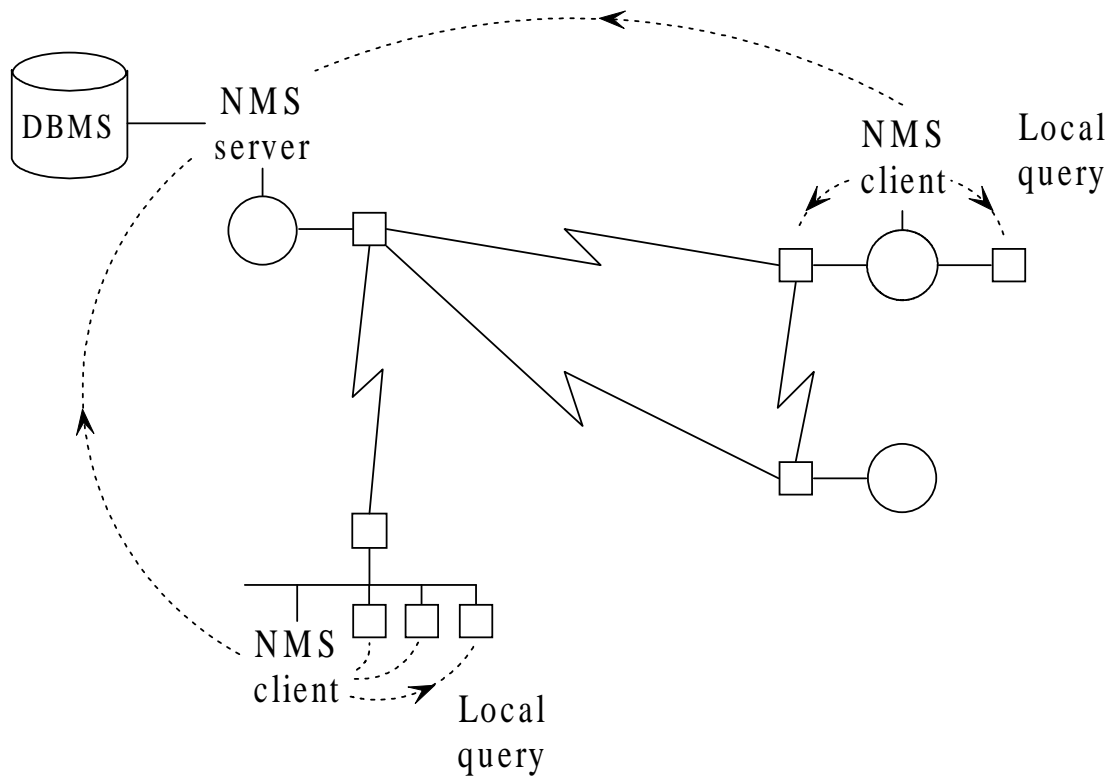
benefits:

- convenience
- accessibility
- security

drawbacks:

- no fault tolerance – backups required
- lack of scalability
- concentration of management load — if connection to NMS severed all management function lost
- network traffic

## Hierarchical



Uses multiple systems with one as central sever and others as clients. Some functions of the platform reside in the server and others reside in the clients.

Using client-server technology the clients would not have separate database systems but use the central server accessing it through the network — the central system requires backups.



## **Benefits & Drawbacks of Hierarchical Topology**

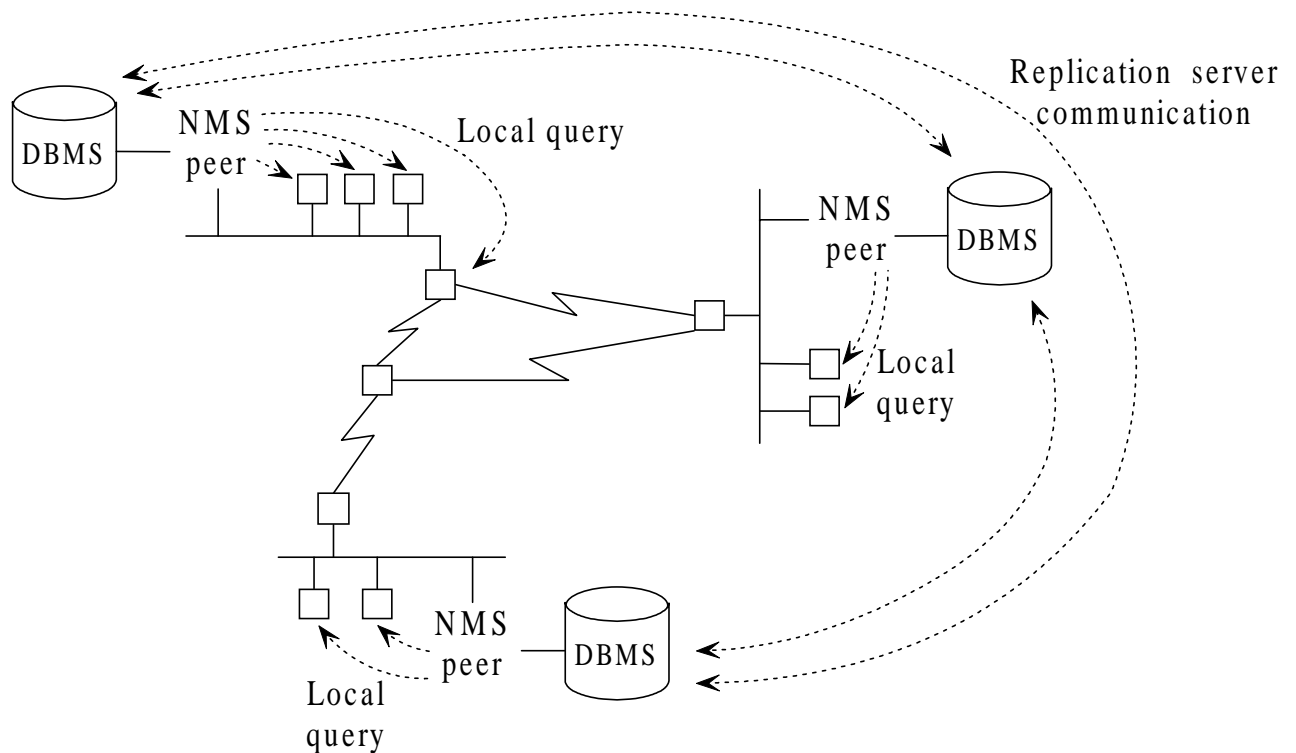
benefits:

- distributed operation
- centralised data storage
- reduction of backbone traffic

drawbacks:

- more complex control/data gathering operations
- division of responsibility between clients and server

## Distributed



Combines the centralised and hierarchical approaches. Uses multiple peer platforms each responsible for a set of network management systems with a replicated, distributed database. One peer is the leader of a set of peer network management systems. Each peer can have a complete database for devices throughout the entire network.

## **Benefits & Drawbacks of Distributed Topology**

benefits:

- distribution of network management tasks
- distribution of network monitoring
- no reliance on single system
- single access approach for all operations, irrespective of physical location

drawbacks:

- synchronisation of distributed database non-trivial and can consume more resources than client-server technology

### **Network Monitoring Calculation Example:**

A network administrator wishes to monitor 5000 workstations to see whether they are switched on or not. In order to do this each machine is periodically pinged. The message size in both directions is 174 bytes. This includes 20 bytes of IP. The administrator's NMS (network management station) is on a 10 Mbps 802.3 switched LAN operating in half-duplex. If each machine is pinged every 50 seconds determine the maximum percentage of the capacity of the LAN connection that is being used in monitoring the workstations. The overhead of the 802.3 frame is 26 bytes.

Total number of bytes each way =  $174 + 26 = 200$  bytes.

Time taken to transmit 200 bytes, including interframe gap

$$= \frac{200 \times 8}{10 \times 10^6} + \text{IFG} = 0.16 \times 10^{-3} + 9.6 \times 10^{-6} \text{ s} = 0.1696 \text{ ms.}$$

So time taken to send and receive a ping =  $0.3392 \text{ ms.}$

Time required to monitor 5000 workstations once =  $5000 \times 0.3392 \times 10^{-3} = 1.696 \text{ s.}$

So percentage of time used in monitoring stations =  $\frac{1.696}{50} \times 100 \approx 3.4\%.$